Identification of weaknesses of the current legislative and organisational set ups inhibiting the successful implementation of mitigation measures and BMPs

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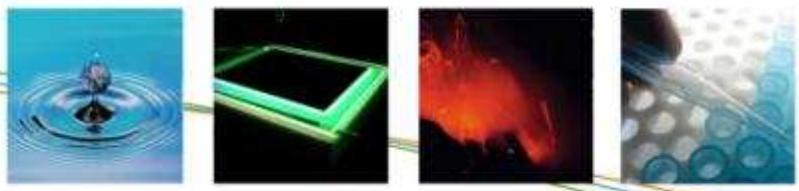

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1 Introduction

Successful and most important effective implementation of measures towards better protection of environment needs clear vision and support from policy makers. With respect to water resources, this vision has been clear for years, since adoption of the Nitrates Directive in 1991 and strengthen by the Water Framework Directive (2000) and Groundwater Directive (2006). For over 25 year EU regulations have been sending a clear message to the society about the need for more intensive actions that need to be taken in order to protect water environment as inputs from various sources of human civilization violate the natural state of this environment to the level that threatens life of fauna and flora and in long term may compromise health of the society.

Over the years many measures have been developed to support the above postulates. With respect to agriculture, which has been named as one of the main reasons for eutrophication of European surface waters, measures needed for enhancing the state of the water environment often required introduction of regulations limiting diffuse pressures, such as use of fertilisers, which restricted production and profitability of businesses. This has never been popular by society, especially individual farmers and groups producing food; and therefore actions were taken within the EU Common Agricultural Policy such as introduction of subsidies (direct payments) that ensured farmers' income stability, and remunerated farmers for environmentally friendly and taking care of the countryside. Additional legal regulations have been introduced to the trade system of plant protection products that require sellers to ensure farmers' do participate trainings on safe use and handling of these harmful substances.

Although much has been done on both regulatory and farmers' support sides, subsequent reports of the estate of the environment published by the European Environmental Agency show that actions taken are not sufficient and the state of EU waters, although improving, is far from satisfactory yet.

In this project it has been identified so far that measures introduced to the agricultural sector have various status of implementation on national levels. Reasons for that are mainly due to the fact that although EU regulations set general rules, these can be differently implemented into national regulations. Experience and societal awareness play important role in successful and effective implementation of measures. What is common across all formal borders is that in general farmers need more external stimulus to implement measures, as on a personal level, profitability of business is more important than care of environment.

An extensive analysis of legal and organizational framework of water governance is undertaken in work package 2 of the Waterprotect project. This report is based on interactions of the project teams with farmers and institutions that are involved in actions at local levels and called by the project team as stakeholders. These are local authorities, farmers' advisory boards, and control institutions such as regional environmental agencies controlling the state of environment and agricultural agencies that are responsible for direct payments schemes. In line with the general philosophy of the project, which is based on the multi actors approach, all these actors have been actively involved in the Waterprotect project from the beginning. Most of work packages have been designed in a way that required extensive consultations with stakeholders, which allowed developing close cooperation structures with them throughout the length of the project. In some

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cases, stakeholders were also included as project partners, for example in Belgium. Such an approach gave the possibility to report the problems from the perspective of actual users that is farmers and institution, at a catchment scale level. Following identification of problems, recommendations for improvement of the current situation proposed in this report also originate from local stakeholders.

The report of formal regulatory framework undertaken in WP2 was planned for delivery in M32, which is end of March 2020. The analysis links closely to works undertaken in this D4.5. report, which in fact needs some input from D2.2 report. The two reports are complementary and shall be read in parallel to understand the whole context of the problem. For that reason the v1 version of this report submitted on the 30th of November 2019 is considered as a draft version and this was communicated to the Commission on the 29th of October 2019 (and noted in the core group meeting minutes of 3rd of October 2019), given the above explanation. The final version of this report is now planned for the 30th of January 2020.

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2 Gowienica Miedwiańska, Poland

2.1 Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts

The cooperation with stakeholders, numerous consultations and activities undertaken during the realisation of the Waterprotect project has allowed to identify barriers that inhibit effective water protection, as follows:

1. Multiplicity and illegibility of legal provisions containing repeated references and supplements excluding the possibility of their overall correct interpretation and efficient application in practice by citizens and even administrative employees (the so-called thicket of regulations), lack of consistency between some legal acts and instability of regulations (frequent changes in legislations).
2. Imprecise provisions resulting in different interpretations and approaches. Some records are often impossible to perform (dead rules) or impossible to control (e.g. some restrictions in intake protection zone).
3. Multiple institutions dealing with water management and environmental protection, due to which competences are dispersed and sometimes overlapping. This results in the lack of knowledge among stakeholders about the right course of action, when there is a need for intervention by the entity responsible for a given action.
4. Frequent changes in organizational structures of state institutions, and even whole institutions, which results in the suspension of the implementation of certain activities or their failure. Excessive centralization of some institutions can also be indicated as a barrier, which, for example, extends the flow of information within the institution and efficient take of corrective actions, as well as insufficient support of local units by headquaters.
5. The inefficient control mechanism, which is affected by:
    a. low percentage of controls carried out in relation to the number of farms due to budget constraints and too little employees; and
    b. low severity penalties for non-compliance, and the lack of punishment inevitability.
6. Absence of one database and information flow between institutions, e.g. irregularities found during an inspection by one of the institutions should be forwarded to other inspection bodies.
7. Little cooperation between actors, sometimes there is a transfer of responsibility between them.
8. Underfunding of institutions from the water management and environmental protection sector, this results in staff shortages and also impacts on very little interest of public workers in tasks that are beyond their responsibilities (e.g. active participation in research and other projects).
9. Lack of high priority for measures for water protection, both from the agricultural sector and in the local arena. No response to irregularities found, e.g. in monitoring results, lack of task continuity, lack of decisive corrective action.

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10. Standards and recommendations from applicable law and action programs are not fully adapted to the occurring climate changes (e.g. mild winters and earlier start of the growing season, and periods of allowed fertilization).
11. Still low ecological awareness of farmers and/or discrepancy between knowledge and taking action. Little sense of responsibility for the environment, focus on maximizing profits. Pro-ecological activities that are undertaken by this group of stakeholders are mainly aimed at obtaining additional funds from agricultural subsidies, but to a lesser extent as a result of flowing benefits for the environment.
12. The impact of consumers on agricultural production is still small (certificates, ecological footprint).
13. Insufficient system of support incentives for pro-ecological activities undertaken by farmers and investments in this area.
14. Too much paperwork required from farmers causes additional costs, confusion and discourages farmers.
15. Important research findings are not efficiently disseminated to the right stakeholders or acknowledged by them in decision process. The Polish action lab has nearly 20 years of monitoring data and scientific findings from the site have been published, yet these have not led to significant changes in governance of the area.
16. Consultation (in general and specifically for example referring to water management) is still a process that needs to be learnt and few people are interested to participate in the consultation. Few participatory processes are carried out prior to the drafting of laws. There is little confidence that farmers' opinions will be incorporated, thus little motivation to participate.

2.2 Recommendation for improvement of the current situation

Considering the identified barriers that prevent effective implementation of corrective actions to improve water quality in the catchment, it is recommended:

1. The introduction of an inter-ministerial, coherent action program, taking into account the results of environmental quality monitoring and scientific research, with an emphasis on the implementation of remedial actions in place of identified irregularities and a systematic assessment of the effectiveness of the implemented program.
2. Increasing the institution's financial resources at the local level.
3. Conducting awareness-raising campaigns in order to increase responsibility for the environmental impact of food producers along the entire production process, creating and strengthening the role of consumers in the agricultural industry.
4. Introduction of a common database for controlling and managing institutions in water management and environmental protection, so as to increase the efficiency of the control mechanism.
5. Increasing financial penalties for irregularities and conducting re-audits to improve the effectiveness of control activities.
6. Increasing the role of voluntary best menagement practices, so that the farmer is more willing to use this form of reducing agricultural pressure on the environment.

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Recently, a growing ecological trend has been observed, and with this, an increase in consumer expectations regarding product quality, natural ingredients of final products and low environmental footprint. This creates new challenges for the agri-food industry, where not only the quality and price of the final product is important for the consumer, but also sustainable development and minimizing pressure on the environment. On the other hand, it is important to protect the interests of farmers and the profitability of farms.

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3 Val Tidone, Italy

3.1 Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts

The results of the monitoring of plant protection product (PPPs) of the regional environmental agency ARPAE and Università Cattolica del Sacro Cuore, within the Waterprotect Project, have revealed an inadequate quality of the superficial aquifers, with values of PPPs higher than the Environmental Quality Standards for groundwater in 15 of the 26 monitored wells. These data, when coupled with the simulation of water drainage at the bottom of the soil layer and its lateral movement, by the use of CRITERIA 3D Model, and the results of several surveys carried out on the field through questionnaires and expert opinions, confirm that one of the causes of contamination is a non-sustainable water management at farm level, especially in the phases of the management and washing of the sprayer waste material and the preparation of the mixture in farm and/or in field.

The prevention of point source contamination lead by this operations through adoption of "good agricultural practice" in pesticides management is recognised by the Italian national legislation (in particular by National Action Plan for the sustainable use of plant protection products, article 6 of Legislative Decree No 150 of 14 August 2012, implementing Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides).

However there is still a low rate of adoption of some mitigation measures which could potentially match the incentives of rural development policy.

1. Proper pesticide storage and handling as treatment of their packaging and remnants are compulsory but improvements and actions could be implemented to ensure that handling, storage and disposal of pesticides and their containers are performed correctly. A still fairly high percentage of farmers (more than 40%) of the area under study don't have a dedicated area for mixing and filling the sprayers.

2. Some compulsory actions as storage, equipment inspections and calibration, respect of non spray zones are in place in nearly all farms, but their effectiveness cannot really be assessed while is not possible to understand if implemented properly by all the farmers.

Some best management practice (as for the correct management of waste water resulting from the internal and external machine cleaning) are discredited by farmers for several reasons as

- are not always compatible with farmers' work organization and landscape situations
- their impact is not ensured, farmers need more information
- are not economically feasible

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3. Training is compulsory, and operators need a certificate to use pesticide. However, despite the quality level of the regional training system, the training is entirely theoretical and does not include demonstrative activities and sharing of experiences.

4. Some legal contradictions restrict the application at national level of the physical/chemical/bio-purification systems as precautionary measures. An analysis of the national legislation has been started in order to understand how this systems are addressed at the national level, the problems related to their implementation. For this purpose it has been considered:

- Directive 2000/60/EC received into Italian law by means of Legislative Decree No 152 of 3 April 2006 entered into force in Italy on 29 April 2006.
- The National Action Plan for the sustainable use of plant protection products, article 6 of Legislative Decree No 150 of 14 August 2012, implementing Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides. In detail annex VI.4 - Recovery or reuse of any leftover spray solution from the sprayer at the end of application and VI.5 - Sprayer cleaning at the end of the application.
- Legislative Decree no. 124 of 22/06/2012 transposing the European Directive 2009/127/EC with specific reference to sprayers.

The contaminated water resulting from the external and internal washing operations of the machines, of containers of pesticides, or leaks/spillage washing operations during the preparation of the mixture are classified as special hazardous waste and for this purpose the current legislation does not allow their treatment at farm level.

5. The main problems in Italy concerning the integration of water resources policy in agriculture is given by the different territorial level of reference to which policies operate. The sustainable management of resources in agriculture, which still represents a major focus of rural development policies, follow a regional programming and, therefore, lose sight of a number of issues due to the presence of inter-regional river basins.

6. In Italy, monitoring activities are organised on a regional basis; therefore, the inclusion of a substance in the monitoring list depends only on the decisions of the regional authorities responsible for the monitoring activity. But our agriculture also varies a lot across the territory. In general, agriculture cannot be defined ‘‘regional’’, high regional variations in crop distributions occur throughout Italy. This ‘‘regional’’ crop variability is strongly related to differences in climate which greatly influence the type of pest to be controlled (and the type of PPP to be used). Knowledge of the regional characteristics of the territory and of

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the type of crops are therefore key parameters for a correct planning of a national reliable monitoring.

7. Problems in the application of the National Action Plan (NAP) and Rural Development Plan (RDP) mainly relate on the fact that targeted actions require, in particular at regional level, skills of all those involved in water governance and therefore the ability to define clear, and easily measurable objectives, the ability to concentrate resources on these objectives in a consistent manner, and the ability to learn from the results obtained to adjust the strategy in progress. This requires also a major involvement of farmers in the process of requirements analysis instead of the adoption of a top down process.
8. On the other side compliance to NAP measure do not necessary motivate farmers that need to understand the processes at work in their crop management systems prior to effectively introducing changes.

3.1 Recommendation for improvement of the current situation

In general farmers could benefit from:
- a major involvement and a better coordination among all actors involved in water governance;
- a real bureaucracy simplification process that provides incentives for the adoption of BMPs that do not compromise the already fragile management of the farm economy;
- a better promotion of BMPs in coherence with context of specific monitoring data.

In order to effectively prevent the point source pollution, considering the identified bottlenecks it is recommended where possible, to rely on good practices technically viable and controllable, preferable to those that require compliance with behavioural rules. Behavioural deviations from good practice are more difficult to control and, as demonstrated in the literature, can effectively cause a risk for the operators and the environment.

In this framework:

1. Actions supporting farms to upgrade or create equipped product mixing areas and for filling the sprayer could be of interest.

2. Link environment and farmers and Demo farming participatory events. The knowledge of the factors involved in the contamination processes allow to adopt behaviors or structural changes aimed at limiting and controlling the contamination. There is a growing interest by farmers and operators in more “modern” communication approaches—experimental, demonstrative, and participatory—with more appropriate techniques, with a clear preference for material in audio–video format. An improvement of the training system it recommend with the use a combination of lessons and group discussions, followed by

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practical demonstrations, which allow “learning” through practice and promote the understanding of the issues addressed.

3. "Purification systems" could represent a good practice and a technically viable alternative mitigation measure of point sources contamination, which enable to treat contaminated liquids from plant protection products directly in the farm.
   However, due to legislative difficulties related to the use of such systems in farms, previously described, UCSC organized a meeting with the water governance leader, Emilia-Romagna Region, to increase awareness on this subject.
   Furthermore, the new National Action Plan (NAP), which will come into force shortly (December 2019) takes into account the problems related to the production of water contaminated by plant protection products. In the draft NAP available on the ministry website for the open consultation is written that Regions and autonomous provinces can activate initiatives to support farmers to manage/treat wastewater/contaminated water in farm or as consortium however, according to methods provided by guidelines of the Ministry of the Environment that are not available yet and that will be provided. Comments were made by the UCSC to reaffirm the importance of not falling again into the contradiction of the previous NAP as the new one, again, suggest as a good practice the collection of contaminated water of which, however, their management and treatment is still not allowed by law with the result to have accompanying CAP measures inapplicable for farmers.

However, small changes seems visible as in the new Program of the Rural Development Plan of Emilia-Romagna region, under the Focus Area 4B, projects related to the decrease of fertilizers and pesticides releases in the environment and improve of water quality are requested. Indeed, UCSC is collaborating with three farmers in the WaterProtect Action lab for the preparation of a proposal for the implementation of impermeable platforms for sprayers washing, containers for collection of water containing the residues and use of a carbon active filtration system for water treatment. The treated water is then collected and reused for further washing. In this way the collected water shouldn’t be considered a waste.

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4 Lower Llobregat, Spain

4.1 Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts

Some bottlenecks have been identified in legal regulations which can produce inefficiency towards protection of water resources from agriculture impacts:

1. There are many institutions dealing with water and environment management. Sometimes there is overlap of competences and sometimes there is not a good communication or cooperation among institutions. The information coming from different institutions can provoke bewilderment for farmers. The farmers, sometimes, don't know who has the competency of every law implementation.
2. There are many regulations concerning water and sometimes they have little sensitive to reality of farmers and take urban citizens more into account (for example: its' not possible to apply animal fertilizer on weekend).
3. Lack of long-term vision for environmental protection with respect to water and agriculture. The duration of 4 years of Catalan government does not allow, in some cases, to advance in questions that required more time required for its implementation.
4. The impact of consumers on agricultural production is still small. Stakeholders that set the market conditions and production are the big buyers (large distribution).
5. Consultation (in general, and specifically for example referring to water management) is still a process that needs to be learnt and few people are interested to participate in the consultation. Few participatory processes are carried out prior to the drafting of laws. There is little confidence that farmers opinions will be incorporated, so lose the motivation to participate
6. Underfunding of institutions from the water management, environmental protection sector, and agriculture departments makes the implementation of necessary improvements difficult
7. Monitoring and analyses for herbicides in water is both complicated and costly, resulting in a poor understanding of i) the influences of handling these products, and ii) mobilisation and transfer processes, which causes difficulties when providing evidence for action.
8. The farmers need to record and control their activity according to GIP and this generates a lot of work and confusion. For this reason they need technical support that increases the cost of production.
9. The obligation to have the phytosanitary applicator card to buy any product is a good measure to rationalize the use of PPP's by farmers and gardeners. However, this obligation is still very new and the farmers need to have certain experience to deal with it. At present, it may occur that old PPP's currently prohibited but stocked in storage places are used.

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10. From November 2016, it is mandatory that all the machinery for the application of PPP's has to be inspected. This is a good measure but it requires a change of mentality among farmers to put it into practice.
11. The effect of adopted corrective actions will be visible only after years.
12. Standards and recommendations from applicable law and action programs are not fully adapted to the occurring climate change (e.g. periodic floods, extreme hot…).
13. In general, all BMP's related to the Integrated Pest Management (IPM) System have a high implementation potential because they are mandatory. However, their cost and complexity can hinder straightforward implementation.

4.2 Recommendation for improvement of the current situation

First of all, it is may be worth to remember that the agriculture sector is contributing to managing the natural environment and the biodiversity of our countries. Agricultural activity involves the transformation of the natural environment, which can be more or less positive or negative depending on the types of crops and agricultural practices. Therefore, it is necessary to promote a model of agriculture that is respectful with the natural environment and with biological diversity, but also it must be economically viable and socially acceptable.

Considering the identified bottlenecks to improve effectiveness of measures towards protection of water resources from agricultural impacts it is recommended:

1. More coordination among institutions related to water and simplification of procedures to benefit the work of the farmers in the Agricultural Park.
2. Simplification of regulations and impose measures that are feasible in practice.
3. Better coordination of and among agriculture, water and environmental departments. It is necessary to clarify who has the competency of every law implementation.
4. Increase finances for local level institutions for the benefit for farmers
5. Draw up a managing programme to deal with the deficiencies of the drainage network in the Agricultural Park.
6. Introduction of a common data base for all water Monitoring Controls made in the Agricultural Park.
7. Conducting awareness campaigns to increase responsibility for the environmental impact of food producers, but always remembering that farmers are needed.
8. Financial compensation would be necessary, with feasible conditions for implementation of the most expensive BMP's application.
9. Promote the adoption of voluntary best management practice. In fact, recently, farmers are more conscious of the benefits to use natural resources in a sustainable way because it impacts satisfactorily both in their quality of life and also in their farms.

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5 Mara (Breboaia) Action Lab, Romania

5.1 Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts

During Water Protect project implementation we identified barriers that inhibit effective water protection (information was gathered via discussions, workshops, with relevant stakeholders):

1. There is little cooperation between relevant stakeholder institutions; if cooperation exists it is not constant due to lack of integrated effort among institutions' action plan; Lack of integrated actions among relevant stakeholder institutions (water authorities, environmental protection agencies, environmental guard, mayor house etc)
2. Too centralized authorities, and this leads to difficulty in having access to information;
3. Unclear roles and responsibilities from authorities; overlapping of certain roles and responsibilities;
4. Lack of specialized personnel to manage water system; insufficient (lack of) training at local level.
5. Consultation (in general, and specifically for example referring to water management) is still a process that needs to be learnt and few people are interested to participate in the consultation, mainly specialized NGO's or directly interested stakeholders and less other categories like farmers.
6. There is low effectiveness in application of legislative regulations;
7. Inefficient control mechanisms, (low budgets, few controls, low penalties for non-compliance, lack of fines/punishment).
8. Lack of sufficient advisory services (funded by state) for farmers in relation to impact of agriculture on water quality, subsidy schemes available, compliance etc;
9. Low awareness of farmers on impact of agriculture on water quality;
10. Inadequate waste management due to lack of sufficient control from authorities (including improper manure waste management systems at local/household level);
11. Insufficient system of support incentives for best practices in relation to water management as well as for agro-ecological approaches.
12. Low transparency on how water management is performed (at local level);

5.2 Recommendation for improvement of the current situation

Considering the identified barriers that prevent effective implementation of corrective actions to improve water quality in the catchment, it is recommended:

1. The introduction of a coherent action program, taking into account the results of environmental quality monitoring and scientific research, with an emphasis on the

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implementation of remedial actions in place of identified irregularities and a systematic assessment of the effectiveness of the implemented program;

2. Conduct a feasibility study that may provide coherent, long term actions for enabling sufficient water quantity at local level (targeting especially periods when water stress is due to increase in tourism flow);
3. Increasing the institutions' financial resources at the local level;
4. Effective implementation of financial penalties for irregularities (applied to juridical but also private entities);
5. Impose to all consumers (at local level) a metering water system so it will prevent losses and may permit further improvements for better water quality;
6. Conducting awareness-raising campaigns in order to increase responsibility for the environmental impact of food producers along the entire production process, creating and strengthening the role of consumers in the agricultural industry;
7. Improve management of water supply system at local level (trainings for personnel, technical investments);
8. Finalize sewage system at local level and provide connection of all households, thus preventing seasonal surface water nitrate pollution;
9. Improve capacity of control activities for proper implementation of legislation;
10. Increasing the role of voluntary best management practices, so that the farmer is more willing to use this form of reducing agricultural pressure on the environment (also take into consideration development of some compensation schemes at local level);
11. Allocate financial resources for setting up advisory services for the benefit of farmers (at local level);
12. Set up and maintain/update a data base at local level with corroborated information related to water quality;
13. Establish a department (at local level, eg within Mayor House, which is the water provider in RO action lab) that may monitor regularly water quality and consequently inform other decision makers and act accordingly for water quality improvement;

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6 Wexford catchments, Ireland

6.1 Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts

WaterProtect is an important platform for bringing stakeholders together to discuss drinking water pollution issues in agricultural landscapes. Within the project it has been identified that:

1. There is a complicated water governance structure with many actors
2. There is a large variability in the stakeholders' perception of the water governance structure and the stakeholders' roles to improve drinking water quality among different sectors
3. There are cases of either overlapping or misunderstanding of duties among stakeholders.
4. There is a large variability in the perception of stakeholders' influence on drinking water quality among different sectors
5. There is a variability in stakeholders' ability to adapt to changes such as the implementation of new measures
6. Policy and science are not commonly integrated causing knowledge gaps where decisions are made
7. Important research findings are not efficiently disseminated to the right stakeholders in order to support decisions on the right measure, in the right place and at the right time
8. It is difficult to have a good overview of drinking water quality as approximately 50% of domestic dwellings in Co. Wexford have an on-site waste water treatment system and typically have their own private drinking water well; these are not part of monitoring programmes
9. Some measures can be attractive for farmers to implement but can be costly or require much time and may therefore require incentives
10. Monitoring and analysing for herbicides in water is both complicated and costly, resulting in a poor understanding of i) the influences of handling these products, and ii) mobilisation and transfer processes, which causes difficulties when providing evidence for action
11. Climate change and inherent weather extremes are enhancing the loss of pollutants in some areas and challenging our understanding for mobilisation and transfer to water and therefore also how to best mitigate the pollutant loss to water.

6.2 Recommendation for improvement of the current situation

Information from stakeholder meetings, surveys and workshops together with findings from on-going research have been collated. From this we conclude the following recommendations:

1) A stronger and more collaborative water governance is needed. For example more collaborative interactions with NGOs.
2) A collaborative approach involving all stakeholders, both bottom-up and top-down to support local evidence and action.
3) Transparency and trust is required and public and private sectors need to be better linked.

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4) An integrated catchment management approach that combines the objectives of drinking water and ecological status.
5) Improved steering mechanisms such as education, economics, infrastructure and regulation.
6) More research for a robust evidence based knowledge transfer and exchange. For example for herbicides we need a better understanding of the mechanisms, drivers and controls of mobilisation and transfer processes (Monitor – understand – inform).
7) An effective Decision Support Tool that allows farmers and advisors to connect to the science and access information would be an important development towards sustainable farm systems.
8) Strategies may require different Decision Support Tools for different stages.
9) Relevant measures need to be designed in a sufficiently detailed and targeted way that they can be readily implemented in the strategic plans of the Common Agricultural Policy.
10) We need to unlock the "Policy-Science paradigm lock": Identify best the methods for improvement, test scenarios and identify where changes are most needed, efficient and adaptable.

An issue in Ireland is the increasing presence of herbicides in source waters potentially used for drinking water. In particular MCPA and its breakdown products which have the potential to negatively impact human health, largely through drinking water. Little is known about many aspects related to this particular herbicide and WaterProtect is gathering a new dataset on the presence of MCPA in surface and groundwater. These data will be used to better understand the processes behind loss to water and therefore aid the choice of right measure at the right time.

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7 Bollaertbeek Action Lab, Belgium

7.1 Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts

Workshops, consultations and discussions with farmers and several stakeholders during the waterprotect project has allowed to identify barriers in legal regulations that inhibit effective water protection, as follows:

1. There are many regulations and some regulations are not clear and difficult to apply in practice. E.g. the product specific buffer zones are different for each product and are even different for one product in different crops. Moreover, these product specific buffer zones are not always easy to find on the product label or on fytoweb. Many farmers find it very complicated and not feasible in practice.
2. Regulations are changing often and become stricter and stricter each few years. Farmers, who already implement measures and try to do their best are often 'punished' and even stricter rules are imposed (f.e. first farmer can implement a measure on voluntary basis, but a few years later these farmers need to maintain the measure and becomes obligated to implement a higher number/percentage of this measure). As a result, farmers lose their faith in legislation and become suspicious and they refuse to implement any measure on voluntary basis. In our workshops, farmers ask for a clear and long-term vision from the government.
3. Some regulation is lacking. An example of the lack of regulations: new drift reducing technology such as low spray boom is not yet included in the list of drift reducing techniques, while farmers in practice are asking for this technology.
4. Imprecise provisions resulting in different interpretations and approaches. A reason for that is that some regulations are developed by different governmental departments f.e. environment and agriculture. This different departments have different interest and they stick to their own interests so they do not come to clear legislation and feasible solutions in practice. An example of different interpretations of regulation is the regulation on filling and cleaning places and remnant purification systems. This regulation is written very consice, which has the advantage that a farmer can apply it to their local situation on their farm, but this has the disadvantages that the interpretation of this legislation by the officials from agriculture (who have to disseminate to the farmers) and the officials from environment (who have to give the environmental permit) can be different resulting in a refusal of an environmental permit for farmers to install a cleaning and filling place or purification installation, while the farmer and officials from agriculture are convinced that the farmers respect all the rules.
5. No controls or low percentage of controls for some regulations due to lack of employees and/or budget constraints. Farmers who do not comply with the regulations are not or hardly punished, which discourages the others, who do their best.
6. There is still a lack of awareness on the problem of water pollution by PPP.

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7 Low support incentives for best management practices for improvement of water quality and agro-environmental schemes
8 In waterprotect, we focus on the regulations for PPP. There are already many regulation on water protection of PPP but besides these regulations, there are many more (sometimes very related) regulations for farmers f.e. nutrients regulation, erosion regulation… Farmers are often overwhelmed by all this regulations and do not see the wood for the trees anymore.

7.2 Recommendation for improvement of the current situation

Considering the identified barriers that prevent effective implementation of corrective actions to improve water quality in the catchment, it is recommended:

1 Simply regulation and impose measures that are feasible in practice. This regulation need to be clear, without possibilities for interpretation, although different governmental departments have to work together. These different departments have to see and work together to the common goal they want to reach.
2 Coherent, long term action plan for water quality improvement from the government, in which the farmers taking measures and doing their best are rewarded for their efforts, while the ones not complying with the regulations are punished.
3 Effective implementation of financial penalties for irregularities (applied to juridical but also private entities);
4 Conducting awareness-raising campaigns in order to increase responsibility for the environmental impact and water quality of farmers.
5 Higher incentives for best management practices for improvement of water quality and agro-environmental schemes

We also want to stress that there is a growing interest from consumers to have products that are produced in a sustainable way with respect for the environment and without pollutions of the water courses. A more sustainable food production, we only can encourage! However, many consumers/supermarkets/food processing industry is not yet willing to pay an additional price for these ‘more sustainable’ products. However, this more sustainable food production entails an additional price and it is necessary that consumers and the entire food production chains becomes aware of this and pay this additional price for these more sustainable products to keep farming economically viable. At the moment, farmers must compete with cheap products from regions where sustainability is not important, which is an unfair competitive position and therefore must rely on incentives from agro-environmental schemes (if they are available).

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8 Vester Hjerk, Denmark

8.1 Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts

The focus of the work with the farmers in Vester Hjerk is on an optimal localization of crops and farm management at field, farm and above farm level. This scope is a consequence of the relatively high implementation of existing suitable BMPs in the area and our intention to include a relatively large area of interest taking into account the uncertainty in the delineation of the groundwater extraction area for the local waterworks. This means that the focus is not on a wide range of BMPs, but on an optimal localization at different spatial levels of a relatively small number of farming practices. The main 'BMPs' included are: 1) Crops and rotations with high risk of leaching versus crops and rotations with low risk of leaching (linked to BMP1), 2) Reduced application on vulnerable areas/increased application on robust areas (Linked to BMP 1 and 76) and 3) Plant cover in autumn and winter (BMP 10). The 'BMPs' selected above requires no or only small changes for the farmers in the overall crop-mix, but our hypothesis is that an optimal spatial allocation of the crops and the farm management is sufficient to reach an acceptable level of leaching for the agricultural area within the extraction area of Vester Hjerk water work.

Some of the bottlenecks and recommendations below refer directly to the approach for solving the groundwater issue together with the farmers (bottlenecks 1 – 6 and recommendation 1- 6). The remaining bottleneck and recommendation (no. 7) is more general, but identified in the work in the Action Lab and only included here as it is closely linked to agriculture and farming practices.

The bottlenecks and recommendations do not draw a sharp line between legal regulations and governance. Some of the issues raised are thus indirectly linked to legal regulations.

1. There is still uncertainty in relation to the delineation of the extraction area for the Vester Hjerk water work. It is questionable if the delineated area currently included in the legislation is correct, which makes it difficult to plan implementation of measures, except for the agricultural area just around the two abstraction wells providing the drinking water. It is likely that the farmers will question more demanding measures on agricultural land further away from the waterworks.
2. There is a lack of identification and mapping of vulnerable and robust agricultural land at the local level (fields and below) in relation to the protection of the groundwater. Spatial optimization of farming practices requires detailed information on the biophysical endowment and acknowledged identification of the differentiation in vulnerable and robust areas in terms of impact of agricultural practices.
3. Currently the regulation of the use of fertilizers in Denmark restricts the use at the farm level (based on standard norms for crops taking into account soil conditions etc.). An effective implementation of spatially optimized farming practices requires regulation below the farm level – in some cases even below the field level.
4. The implementation of measures for the protection of the groundwater at local level are based on estimates of leaching based on modelling with no or very little differentiation of

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the area of the extraction zone. The modelling does consider some local variables, but important variables such as drainage and location of catch crops are not included.

5. The extraction area of Vester Hjerk water works is not integrated in the targeted regulation of agriculture at catchment level in the same way as the areas identified for the protection of surface waters. Options to take into account the protection of drinking water in the implementation of for example regulation of catch crops is thus not available.
6. The farmers only have limited options to take advantage of measures implemented above or with impacts above the farm level. In some cases measures implemented by one or more farmer leads to a reduced impact on the groundwater within a catchment that potentially could lower the need for other farmers in the same catchment to implement measures. This is today only possible for a limited number of measures.
7. Different policy areas are not always well coordinated. In Vester Hjerk, two examples surfaced in the Action Lab. Point 5 above pointed to the coordination of the protection of groundwater and the protection of surface waters and coastal recipients. Another example was a grazing project that was not implemented due to lack of funding. The project would not only have been a benefit from a nature conservation point of view, but could also have contributed to protection of both groundwater and surface water.

8.2 Recommendation for improvement of the current situation

Considering the identified bottlenecks that prevent effective implementation of spatially optimized farming practices to improve groundwater protection in the Vester Hjerk Action Lab, the following recommendations can be given (the numbers of the recommendations refer to the list of bottlenecks above):

1. The extraction area for the Vester Hjerk water work should be established as soon as possible to enable implementation of the necessary measures to protect the groundwater However, it is a very complicated and long process to change the delineation of the extraction area in the legislation. Given this timeframe and the uncertainty inherent in the identification of the extraction area, it might be feasible to identify a larger area for implementation of measures voluntary for the farmers.
2. The mapping of vulnerable and robust areas should be improved aiming to represent the field level and below. The map should consider both impact on groundwater, surface waters and coastal recipients and include drainage information and improved differentiation of retention.
3. At least on vulnerable areas the use of fertilizers should be restricted at field level or even below where needed due to differences in the endowment. The mapping of robust and vulnerable areas recommended in point 2 is required for the implementation of the recommendation. Restrictions at or below field level raises questions on control and compliance to be considered in the implementation.
4. The modelling used to identify farming practice measures to protect the groundwater should be improved by including more spatially explicit data on for example drainage and

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catch crops. To ensure acceptance by farmers, the modelling ideally could be combined with measurements of nitrate in drainage systems or catchments.

5. The protection of surface water and costal recipients is currently better integrated in the regulation of agriculture than the protection of groundwater. An example is the regulation of the distribution of catch crops, which targets smaller catchments for the protection of surface waters. Protection of groundwater, i.e. in Vester Hjerk the extraction area, should be included in the targeting providing incentive to the farmers to have catch crops in vulnerable areas.
6. Currently a few measures have been implemented allowing initiatives by single farmers to benefit a wider group of farmers. It is the case for constructed wetlands where the effect of the wetlands is included in the calculation of reduction efforts at catchment level and for voluntary catch crops where a high uptake prevents obligatory catch crops at catchment level. It should be evaluated if the same principles can be implemented for a wider range of measures.
7. Different policy areas including the protection of groundwater should be better coordinated. Multiple benefits should be identified both at the planning level and in the evaluation of specific projects.

Vester Hjerk can be seen as an example of a water works where: 1) The problem to solve is not too severe, 2) there is a natural differentiation in robust and vulnerable areas in the extraction area, and 3) the farms are relatively large compared to the size of the extraction area. This provides a scope for protecting the groundwater by optimizing the spatial organization of farming practices. The recommendations above would enhance the implementation of the approach significantly.

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9 Summary

Based on the received answers all identified bottlenecks and recommendations at action lab levels were compared with each other, which allowed finding similarities between action labs. Although each action lab looked through the prism of their own problems and were provided in different wording patters, many problems proved to be common and expand above the local level. This led to a conclusion that problems that have a negative impact on the effectiveness of measures (and subsequently recommendations to remove them) can be systemized in few categories, touching different grounds and these were named as follows:

a. Legislative
b. Organizational
c. Political
d. Sociological
e. Technical

Another observation was that both barriers and recommendations can vary depending on the scale of application. Some of these can be applied at a very local level, while others depend on more regional or national scales. For the purpose of this report barriers and recommendation specified by action lab leaders in the particular pilot areas were summarized in Tables 1 & 2. Descriptive summary of these, systemized according to the highest number of countries that provided the same or similar answers is given below.

9.1 Summary of barriers that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts:

1. The barrier that was most commonly pointed out (by 6 out of 7 participating action labs) was **too complex organizational set up of institutions responsible for implementation and execution of water management policies**. This was highlighted by Poland, Italy, Spain, Romania, Ireland and Belgium. The general conclusion is that there are **too many institutions involved in water management at national and regional/local levels**, which causes roles and responsibilities to be unclear and sometimes overlapping. Many countries noted a definite dispersion of competences and a large variability in the stakeholders' perception of the water governance structure and the stakeholders' roles. This confuses farmers and discourages them to get in contact with specific authorities and inhibits uptake of actions.
Type of barrier: *organizational*
Scale: *national/local*

2. **Little cooperation between stakeholders** at local level was pointed out by 4 of out 7 action labs (Poland, Italy, Spain and Romania) as another important factor hindering the effectiveness of measures. By lack of cooperation it is understood not only **little integrated effort** in defining and implementing measures (which relates to point 2), but also **lack of communication and exchange of information** and this concerns both planes: institutions - institutions and institutions – farmers/NGOs, etc. This further implies that voices of some stakeholders are not heard by others

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and that actions taken favor specific groups of stakeholders. This was highlighted by farmers during multiple workshop meetings undertaken by action labs in Poland, Belgium, Italy, Romania and Spain. Spanish partners specifically highlighted that some of water regulations are not sensitive to reality of farmers and that needs of urban citizens are taken more into consideration than needs of farmers.
Type of barrier: *organizational*
Scale: *local*

3. **Regulations from different policy areas, such as groundwater, surface water, drinking water, agriculture and nature conservation should be better coordinated.** This was indicated by 4 action labs: Poland, Italy, Belgium and Denmark. Regulations developed by different governmental departments are focused on their own interests only. This creates situations where finding practical solutions at a local level is very difficult, as requirements of one regulation often contradict requirements of the other. On the other hand, the implementation of one measure can often fulfill requirements of more than one regulation and this can significantly boost their effectiveness, reduce costs of programmes of measures and as such allow more measures to be introduced. This requires good coordination and an integrated water management at local levels.
Type of barrier: *legislative*
Scale: *national*

4. On the other hand, **low awareness of farmers regarding impacts they may cause on the environment** have also been identified as an important barrier, noted by 4 out of 7 action labs (Poland, Italy, Romania, Belgium). The Waterprotect project revealed that farmers in general still have a problem with linking how their everyday activities may affect the environment.
It has been noted that the economic sustainability of the activity prevails over environmental sustainability. The family economy and personal goals influence the transition to sustainable agriculture. Nonetheless, this links closely to the problem of **little transparency of environmental monitoring programmes which do not inform farmers about their findings**. Farmers are not aware about water quality results from national/regional water monitoring campaigns in their areas and as such are not aware of impacts they make.
Type of barrier: *sociological*
Scale: *local*

5. Another common barrier highlighted by 3 out of 7 action labs (Poland, Italy and Belgium) was **multiplicity of regulations, which often are unclear**. Farmers need to be aware of multiple regulations regarding nitrates, ammonia, PPP, erosion control, etc. some of which are very long and complex. This causes regulations to be difficult to apply and to control in practice not only by farmers, but also by civil servants. In Belgium it was highlighted that farmers are overwhelmed by all agricultural regulations that they need to be aware of and some of them do not see the wood for the trees anymore. In Poland multiple changes in regulations and subsequent cross references in changing legal acts are the cause of misunderstanding and are difficult to interpret by people not specialized in law.
Type of barrier: *legislative*
Scale: *national*

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6. Three of out seven action labs (Poland, Romania and Belgium) indicated **inefficient control mechanisms** to be factors inhibiting implementation of measures. There are two aspects in here to be considered. First of all **lack of actions taken towards those that do not fulfill legal requirements makes farmers to feel above the law and do not motivate them to take actions**. Another aspect that has been highlighted by farmers themselves is that **the lack of control and actions towards those who break the law discourages farmers that take actions and do things according to legal protocols**. Additional problem highlighted by Poland is the **height of environmental fines, which are too low for big scale farmers to respect them**. Farmers often admitted themselves that breaking laws and paying fines is more worthwhile to their business than introducing measures required by law.
Type of barrier: *legislative*
Scale: *national*

7. Poland, Spain and Belgium pointed out **the lack of long-term vision for environmental protection** with respect to water and agriculture to be an important problem. This relates to frequent changes in regulations and lack of continuity in approaches taken. The environment needs time to respond to changes that have been introduced. Belgium highlighted that regulations change too often and become stricter and stricter each few years. Farmers, who already implement measures and try to do their best are often 'punished' when stricter rules are imposed. As a result, farmers lose their faith in legislations; they become suspicious and refuse to implement measures on a voluntary basis. In the Waterprotect workshops, **farmers asked for a clear and long-term vision from the government**. The duration of 4 years of governments does not allow to advance in questions that require more time for its implementation. In addition, Poland highlighted the lack of high priority for measures for water protection, both from the agricultural sector and in the local arena, no response to irregularities found, e.g. in monitoring results, lack of task continuity and lack of decisive corrective action.
Type of barrier: *political*
Scale: *national*

8. Italy, Spain and Ireland noted also that **time is needed for stakeholders to adapt to changes**. This regards not only logistical issues such as time needed for utilization of older products that have been made prohibited but may still be stored by farmers, but also mental ability of people to adapt to changes such as the implementation of new measures.
Type of barrier: *sociological*
Scale: *national/local*

9. Poland, Spain and Ireland think that **standards and recommendations from applicable law and action programs are not fully adapted to the occurring climate changes** (e.g. mild winters and earlier start of the growing season, and periods of allowed fertilization). Climate change and inherent weather extremes enable the loss of pollutants in some areas and challenge our understanding of their mobility and transport paths to the waters and therefore determining the best mitigate measures to prevent further pollution.
Type of barrier: *legislative*
Scale: *national*

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10. Poland, Romania and Belgium advocated that **systems of support incentives** for best practices in relation to water management as well as for agro-ecological approaches **are too little**. In Poland, there are premises that cultivation on a particular land is more beneficial than applying new voluntary BMPs and receiving subsides for that action. This is especially visible in areas with rich soils that can be cultivate intensively with profitable results. As a result, little interest is given for new more environment friendly initiatives on a voluntary basis.
Type of barrier: *legislative*
Scale: *national*

11. Italy, Spain and Ireland highlighted that there is **too little financial support for implementation of more advanced measures that are expensive**. These measures can be attractive to implement but their cost and complexity can hinder straightforward implementation.
Type of barrier: *legislative*
Scale: *national*

12. **Too much bureaucracy.** Filling of paperwork required from farmers causes additional costs and confusion (Poland, Italy and Spain).
Type of barrier: *legislative*
Scale: *national*

13. Three countries Italy, Poland and Ireland noted the **lack of knowledge transfer from science to policy**. Policy and science are not commonly integrated causing knowledge gaps where decisions are made. Important research findings are not efficiently disseminated to the right stakeholders or are not acknowledged enough in order to support decisions on the right measure, in the right places and at the right time. For example the action lab studied in Poland has a very long lasting history of research, yet their findings have not led to changes in local policies and regulations.
Type of barrier: *organisational*
Scale: *national/local*

14. **Lack of interest in participation in the process of law creation**. Polish, Spanish and Romanian partners informed that consultation (in general, and specifically with respect to water management) is still a process that needs to be learnt and few people are interested to participate in the consultation, mainly specialized NGO's or directly interested stakeholders. **Farmers have little confidence that their opinions will be incorporated, so they have little motivation to participate.**
Type of barrier: *sociological*
Scale: *national/local*

15. Italy and Denmark noted also that **regulations are not adequate to scale of the problem**. For example, Danish regulations of the use of fertilizers restricts the use at the farm level, while an effective implementation of spatially optimized farming practices requires regulation below the farm level – in some cases even below the field level. This is especially valid for countries where large farms dominate.
In Italy the problem is broader and lies in the fact that water related policies in agriculture operate at different territorial levels. The sustainable management of resources in agriculture follows the

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regional programmes and, therefore, loses sight of local issues at a scale of catchments. Also monitoring activities are organised on a regional basis; thus, the inclusion of a substance in the monitoring list depends only on the decisions of the regional authorities responsible for the monitoring activity. But the agriculture varies a lot across the territory. In general, agriculture cannot be defined on a regional scale as there are large regional variations in crop distributions throughout Italy. This ''regional'' crop variability is strongly related to differences in climate which greatly influence the type of pest to be controlled (and the type of PPP to be used). Knowledge of the regional characteristics of the territory and of the type of crops are therefore key parameters for a correct planning of a national reliable monitoring.
Type of barrier: *legislative*
Scale: *national/local*

16. The problem of **too centralized authorities impacting on the access to information, data** and cooperation was highlighted by Poland and Romania.
Type of barrier: *organisational*
Scale: *national*

17. **Small impact of consumers on agricultural production**. Although specified by only two countries (Poland and Spain), it raises the issue of linkages between society and farmers. At present mostly big buyers can set the market conditions and these are not necessary focused on protection of the local environment. Nonetheless, in Work Package 6 of the Waterprotect project a number of positive examples of how the small market can stimulate farmers behavior have been also exploited.
Type of barrier: *sociological*
Scale: *local*

18. On local scales **problems exist with precise data allowing relationship establishment between agricultural activities and quality of water** resources and this can be attributed to different factors. For example, in Denmark lack of good understanding of the delineation of the extraction area questions the correctness of legislations in place. Spatial optimization of farming practices requires detailed information on the biophysical endowment and acknowledged identification of the differentiation in terms of impact of agricultural practices. In Ireland the problem of disperse housing was raised. Approx. 50% of domestic dwellings in Co. Wexford have an on-site wastewater treatment systems and typically have their own private drinking water - supply; these are not part of monitoring programmes.
Type of barrier: *technical*
Scale: *local*

19. The above relates to **high costs of monitoring**, which was raised by Ireland and Spain. Monitoring and analysing for herbicides in water is both complicated and costly, resulting in a poor understanding of i) the influences of handling these products, and ii) mobility and transfer pathways, which causes difficulties when providing evidence for action.
Type of barrier: *technical*
Scale: *local*

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20. Numerical **tools used for planning are based on models that allow for no or very little differentiation of the area** of the extraction zone. The modeling does consider some local variables, but important variables such as drainage and location of catch crops are not included. Precise planning requires adequate modeling tools and, what is most important, local, or even site specific data/information (Denmark and Italy).
Type of barrier: *technical*
Scale: *local*

21. **Underfunding of institutions from the water management, environmental protection sector**, **and agriculture departments** makes the implementation of necessary improvements difficult. As reported by Poland and Spain this results in staff shortages and also impacts on very little interest of public workers in tasks that are beyond their responsibilities (e.g. active participation in research and other projects).
Type of barrier: *political*
Scale: *local*

Remaining barriers were pointed only by not more than one action lab:

In Poland barriers that inhibit the successful implementation of measures are:

1) **Instability of the water governance structure** causing periodic suspensions in implementation of regulations (political/national), and

2) **Lack of a common database that is shared by many institutions**. This would allow to share information about the state of the environment and irregularities found and this would allow following actions that require an engagement of different institutions (technical/local).

In Romania barriers that inhibit the successful implementation of measures are:

1) **Low transparency in water management** (political/national)**,**

2) **Lack of specialized personnel to manage water systems** (technical/local)**,**

3) **Lack of sufficient advisory services (funded by state) for farmers** in relation to impact of agriculture on water quality, available subsidy schemes, compliance, etc. (technical/local)

In Italy barriers that inhibit the successful implementation of measures are:

1) **Problems with poor installation of measures that inhibit their effectiveness** (technical/local)**,**

2) **Effectiveness of measures difficult to assess** (technical/local)**,**

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3) **Lack of practical trainings.** Trainings are compulsory. However, despite the quality level of the regional training system, these are entirely theoretical and do not include demonstrative activities and sharing of experiences. (technical/local)

In Ireland there is also a large variability in the perception of stakeholders influence on drinking water quality among different sectors (sociological/national).

In Belgium, although there is a general problem with too many regulations in place, some technologies are not yet regulated (low spray boom) and this needs to be regulated (legislative/national).

In Denmark, the farmers only have limited options to take advantage of measures implemented above or with impacts above the farm level. More flexibility for above farm level implementation of measures is needed (legislative/local).

9.2 Summary of recommendation for improvement of the current situation

1. All seven action labs pointed out **that better coordination between policy areas is required**. This means stronger and **more collaborative water governance structure**, introduction of an inter-ministerial, **coherent action programs, taking into account the results of environmental quality monitoring and scientific research**, with an emphasis on the implementation of **remedial actions in places of identified irregularities** and a **systematic assessment of the effectiveness of already implemented strategies**. **Regulations need simplification and practical feasibility**. Different governmental departments should work together to achieve the **common goal**. **Multiple benefits** should be identified both at the planning level and in the evaluation of specific projects. Action plans need to be planned in a coherent way with a **long term vision**.
Type of recommendation: *legislative/political*
Scale: *national*

2. Six out of seven action labs (Poland, Italy, Spain, Romania, Belgium and Ireland) highlighted **the need for undertaking awareness raising campaigns** in order to increase responsibility of food producers for the environmental impact along the entire production process. This shall strengthen the role of consumers in the agricultural industry but will also stress the importance of farmers as food producers.
Type of recommendation: *sociological*
Scale: *national/local*

3. Countries such as Poland, Italy, Spain, Romania and Ireland recognized **the need for increasing finances of local institutions** responsible for water management and agriculture.
Type of recommendation: *political*
Scale: *national/local*

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4. **Better promotion of voluntary best management practices** by giving comprehensive information on their positive effects on soil condition, farm economics and living standards is needed in Poland, Italy, Spain and Romania. The farmers are more willing to implement the measures when the exact benefits are fully understood by them.
Type of recommendation: *sociological*
Scale: *national*

5. **Provision of a collaborative tool/common database/decision support tool** containing corroborated information related to water resources and agriculture and developed on scientific information was highlighted by four countries (Poland, Spain, Romania and Ireland) as a recommended tool for various stakeholders from water management, agriculture and environmental protection sector that would help **to connect stakeholders locally**. This would **allow for access and sharing of data as well as helping in decision making process** and this would be an important development towards sustainable management on a local scale.
Type of recommendation: *technical*
Scale: *national/local*

6. **Provision of an efficient control mechanisms** seem to be an important and motivating factor for the successful implementation of measures, highlighted by four out of seven action labs including Poland, Italy, Romania and Belgium. This not only refers to control of farmers, but also big farms and food producers.
Type of recommendation: *legislative*
Scale: *national/local*

7. Farmers are open for implementation of **more complex measures**; however **a structured incentive programme is required** to make it affordable for farmers (Italy, Spain, Belgium) especially for more expensive measure (f.e. filling and cleaning places with remnant purification system or grass buffer strips for PPP).
Type of recommendation: *legislative*
Scale: *national/local*

8. Italy, Spain and Belgium recommended also **simplification of regulations** with the focus on practical feasibility of implementation of measures. Language in which regulations are written shall be transparent and easy to read and understand by the society. There shall be no possibility for misinterpretation.
Type of recommendation: *legislative*
Scale: *national*

9. **Better collaboration between institutions and actors** involving all stakeholders, both bottom-up and top-down to support local evidence for action was pointed out by three project partners: Italy, Spain and Ireland. This collaboration should be transparent and based on trust and shall lead to simplification of procedures.
Type of recommendation: *organisational*
Scale: *national/local*

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10.The importance of **knowledge transfer from scientific research projects** to legislation was noted by two action labs, specifically Italy and Ireland. More research for a robust evidence based on knowledge transfer and exchange is needed, but more important is unlocking the "Policy-Science paradigm lock": Identify the best methods for improvement, test scenarios and identify where changes are most needed, efficient and adaptable.
Type of recommendation: *legislative*
Scale: *national*

11.In addition to the above, Italy and Romania suggested **more practical trainings**, including **development of demonstration farms**. There is a growing interest by farmers and operators in more **"modern" communication approaches**—experimental, demonstrative, and participatory—with more appropriate techniques, with a clear preference for material in audio–video format. **An improvement of the training system** is recommended with the use of a combination lessons and group discussions, followed by practical demonstrations, which allow "learning" through practice and promote the understanding of the issues addressed.
Type of recommendation: *technical*
Scale: *national/local*

12.Ireland and Denmark highlighted the need for **good understanding of catchment hydrodynamics in order to design effective measures** and this needs to be addressed at local scales.
Type of recommendation: *technical*
Scale: *local*

Remaining recommendations were pointed only by not more than one action lab; hence these can be regarded as of rather local but still high importance.

In Romania the following additional recommendations regarding the local situation were made:

1) **Need for change in water governance structure**(organisational/local)**,**

2) **Need to conduct a feasibility study to provide a long term action plan** (technical/local)**,**

3) **Implementation of metering system for water use** (technical/local)**,**

4) **Need to allocate additional resources so that the existing sewage system becomes functional and connects the entire households in the catchment** (technical/local)**.**

In Italy the following additional recommendations regarding the local situation were made:

1) **Actions supporting farms to upgrade or create equipped product mixing areas and for filling the sprayer could be of interest** (technical/local)**,**

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2) **"Purification systems" could represent a good practice and a technically viable alternative mitigation measure of point sources contamination, which enable to treat contaminated liquids from plant protection products directly in the farm** (technical/local)**.**

In Spain the following additional recommendations regarding the local situation were made:

1) **Draw up a managing programme to deal with the deficiencies of the drainage network in the Agricultural Park's** (technical/local)**.**

In Denmark the following additional recommendations regarding the local situation were made:

1) **Need for evaluation of effectiveness of measures at different scales** (technical/local)**,**

2) **Use precautionary principle when necessary and design measures at broader areas when time is needed for defining precise locations for actions** (technical/local)**.**

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Table 1 Summary of barriers inhabiting the effective implementation of measures towards protection of drinking water sources from agricultural practices identified in the Waterprotect action labs.

No.	Type of barrier	Scale	Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts - short description of the problem	Bottlenecks in legal regulations that inhibit the effectiveness of measures towards protection of water resources from agricultural impacts - descriptions as stated by Action Lab Leaders	PL	IT	ES	RO	IRE	BE	DK
1	Organizational	national/local	Too many institutions (actors) involved in water management. This causes: - unclear roles and responsibilities, sometimes overlaping; - different understanding of roles and responsibilities by different actors; - dispersion of competences; - confusion among farmers regarding competences of law implementation.	Multiple institutions dealing with water management and environmental protection, due to which competences are dispersed and sometimes overlapping. This results in the lack of knowledge among stakeholders about the right course of action, when there is a need for intervention by the entity responsible for a given action. There are many institutions dealing with water and environment management. Sometimes there is overlap of competences and sometimes there is not a good communication among institutions. The information coming from different institutions can provoke bewilderment for farmers. The farmers, sometimes, don't know who has the competency of every law implementation. Unclear roles and responsibilities from authorities; overlapping of certain roles and responsibilities; There are cases of either overlapping or misunderstanding of duties among stakeholders There is a complicated water governance structure with many actors. There is a large variability in the stakeholders' perception of the water governance structure and the stakeholders' roles to improve drinking water quality among different sectors	Yes	Yes	Yes	Yes	Yes	Yes	
2	Organizational	local	Little cooperation between stakeholders (institutions, farmers, etc.)	Little cooperation between actors, sometimes there is a transfer of responsibility between them. There is little cooperation between relevant stakeholder institutions; if cooperation exists it is not constant due to lack of integrated effort among institutions' action plan; Lack of integrated actions among relevant stakeholder institutions (water authorities, environmental protection agencies, environmental guard, mayor house etc) There are many regulations concerning water and sometimes they have little sensitive to reality of farmers and take urban citizens more into account (for example: its' not possible to apply animal fertilizer on weekend). Problems in the application of the National Action Plan (NAP) and Rural Development Plan (RDP) mainly relate on the fact that targeted actions require, in particular at regional level, skills of all those involved in water governance and therefore the ability to define clear, and easily measurable objectives, the ability to concentrate resources on these objectives in a consistent manner, and the ability to learn from the results obtained to adjust the strategy in progress. This require also a major involvement of farmers in the process of requirements analysis instead of the adoption of a top down process.	Yes	Yes	Yes	Yes			

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3	Legislative	national	Little coordination between different policy areas.	Imprecise provisions resulting in different interpretations and approaches. Some records are often impossible to perform (dead rules) or impossible to control (e.g. some restrictions in water intake protection zone). Imprecise provisions resulting in different interpretations and approaches. A reason for that is that some regulations are developed by different governmental departments f.e. environment and agriculture. This different departments have different interest and they stick to their own interests so they do not come to clear legislation and feasible solutions in practice. Different policy areas are not always well coordinated. In Vester Hjerk, two examples surfaced in the Action Lab. Point 5 above pointed to the coordination of the protection of groundwater and the protection of surface waters and coastal recipients. Another example was a grazing project that was not implemented due to lack of funding. The project would not only have been a benefit from a nature conservation point of view, but could also have contributed to both groundwater and surface water. The extraction area of Vester Hjerk water works is not integrated in the regulation of agriculture in the same way as the areas identified for the protection of surface waters. Options to take into account the protection of drinking water in the implementation of for example regulation of catch crops is thus not available. Some legal contradictions restrict the application at national level of the physical/chemical/bio-purification systems as precautionary measures.	Yes	Yes				Yes	Yes
4	Sociological	local	Low awareness of farmers regarding their impact on the environment. This relates to lack of responsibility for the environment.	Still low ecological awareness of farmers and/or discrepancy between knowledge and taking action. Little sense of responsibility for the environment, focus on maximizing profits. Pro-ecological activities that are undertaken by this group of stakeholders are mainly aimed at obtaining additional funds from agricultural subsidies, but to a lesser extent as a result of flowing benefits for the environment. Low awareness of farmers on impact of agriculture on water quality; There is still a lack of awareness on the problem of water pollution by PPP.	Yes	Yes		Yes		Yes	
5	Legislative	national	Too many regulations.	Multiplicity and illegibility of legal provisions containing repeated references and supplements excluding the possibility of their overall correct interpretation and efficient application in practice by citizens and even administrative employees (the so-called thicket of regulations), lack of consistency between some legal acts and instability of regulations (frequent changes in legislations). There are many regulations and some regulations are not clear and difficult to apply in practice. E.g. the product specific buffer zones are different for each product and are even different for one product in different crops. Moreover, these product specific buffer zones are not always easy to find on the product label or on fytoweb. Many farmers find it very complicated and not feasible in practice. In waterprotect, we focus on the regulations for PPP. There are already many regulation on water protection of PPP but besides these regulations, there are many more (sometimes very related) regulations for farmers f.e. nutrients regulation, erosion regulation… Farmers are often overwhelmed	Yes	Yes				Yes	

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				by all this regulations and do not see the wood for the trees anymore.							
6	Legislative	national	Inefficient control mechanisms. No actions taken towards those who do not comply with regulations effectively discourages farmers, who comply with regulations.	The inefficient control mechanism, which is affected by: a. low percentage of controls carried out in relation to the number of farms due to budget constraints and too little employees; and b. low severity penalties for non-compliance, and the lack of punishment inevitability. Inefficient control mechanisms, (low budgets, few controls, low penalties for non-compliance, lack of fines/punishment). No controls or low percentage of controls for some regulations due to lack of employees and/or budget constraints. Farmers who do not comply with the regulations are not or hardly punished, which discourages the others, who do their best.	Yes			Yes		Yes	
7	Political	national	Lack of long - term vision for environmental protection with respect to water & agriculture. Too many and too often changes in regulations. Lack of continuity.	Regulations are changing often and become stricter and stricter each few years. Farmers, who already implement measures and try to do their best are often 'punished' and even stricter rules are imposed (f.e. first farmer can implement a measure on voluntary basis, but a few years later these farmers need to maintain the measure and becomes obligated to implement a higher number/percentage of this measure). As a result, farmers lose their faith in legislation and become suspicious and they refuse to implement any measure on voluntary basis. In our workshops, farmers ask for a clear and long-term vision from the government. Lack of long-term vision for environmental protection with respect to water and agriculture. The duration of 4 years of Catalan government does not allow, in some cases, to advance in questions that required more time required for its implementation. The effect of adopted corrective actions will be visible only after years; therefore to speed the process up the actions taken need to be substantial, continuous and systematic. Lack of high priority for measures for water protection, both from the agricultural sector and in the local arena. No response to irregularities found, e.g. in monitoring results, lack of task continuity, lack of decisive corrective action.	Yes		Yes			Yes	
8	Sociological	national/local	Variability in stakeholders ability to adapt to changes such as the implementation of new measures and changing habits	There is a variability in stakeholders ability to adapt to changes such as the implementation of new measures. The obligation to have the phytosanitary applicator card to buy any product is a good measure to rationalize the use of PPP's by farmers and gardeners. However, this obligation is still very new and the farmers need to have certain experience to deal with it. At present, it may occur that old PPP's currently prohibited but stocked in storage places are used. From November 2016, it is mandatory that all the machinery for the application of PPP's has to be inspected. This is a good measure but it requires a change of mentality among farmers to put it into practice.		Yes	Yes		Yes		

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9	Legislative	national	Too little attention given to variability of climatic conditions due to climate change in standards and regulations.	Standards and recommendations from applicable law and action programs are not fully adapted to the occurring climate changes (e.g. mild winters and earlier start of the growing season, and periods of allowed fertilization). Climate change and inherent weather extremes are enhancing the loss of pollutants in some areas and challenging our understanding for mobilisation and transfer to water and therefore also how to best mitigate the pollutant loss to water.	Yes		Yes		Yes		
10	Legislative	national	Low support/insufficient system of incentives for takich pro-ecological actions such as implementation of BMPs and other agro-ecological activities.	Insufficient system of support incentives for pro-ecological activities undertaken by farmers and investments in this area. Insufficient system of support incentives for best practices in relation to water management as well as for agro-ecological approaches. Low support incentives for best management practices for improvement of water quality and agro-environmental schemes	Yes			Yes		Yes	
11	Legislative	national	No or little financial support for implementation of measures that are expensive - need for incentives.	In general, all BMP's related to the Integrated Pest Management (IPM) System have a high implementation potential because they are mandatory. However, their cost and complexity can hinder straightforward implementation. Some measures can be attractive for farmers to implement but can be costly or require much time and may therefore require incentives.		Yes	Yes		Yes		
12	Legislative	national	Too much paperwork required from farmers causes additional costs and confusion.	The farmers need to record and control their activity according to GIP and this generates a lot of work and confusion. For this reason they need technical support that increases the cost of production.		Yes	Yes				
13	Organizational	national	Lack of knowledge transfer from science to policy.	Policy and science are not commonly integrated causing knowledge gaps where decisions are made Important research findings are not efficiently disseminated to the right stakeholders in order to support decisions on the right measure, in the right places and at the right time.	Yes	Yes			Yes		
14	Sociological	national/local	Lack of interest in participation in the process of law creation.	Consultation (in general, and specifically for example referring to water management) is still a process that needs to be learnt and few people are interested to participate in the consultation, mainly specialized NGO's or directly interested stakeholders and less other categories like farmers. Consultation (in general, and specifically for example referring to water management) is still a process that needs to be learnt and few people are interested to participate in the consultation. Few participatory processes are carried out prior to the drafting of laws. There is little confidence that farmers opinions will be incorporated, so lose the motivation to participate.	Yes		Yes	Yes			

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15	Legislative	national/local	Problem of scale to which policies apply	Currently the regulation of the use of fertilizers in Denmark restricts the use at the farm level (based on standard norms for crops taking into account soil conditions etc.). An effective implementation of spatially optimized farming practices requires regulation below the farm level – in some cases even below the field level. The main problems in Italy concerning the integration of water resources policy in agriculture is given by the different territorial level of reference to which policies operate. The sustainable management of resources in agriculture, which still represents a major focus of rural development policies, follow a regional programming and, therefore, lose sight of a number of issues due to the presence of inter-regional river basins. In Italy, monitoring activities are organised on a regional basis; therefore, the inclusion of a substance in the monitoring list depends only on the decisions of the regional authorities responsible for the monitoring activity. But our agriculture also varies a lot across the territory. In general, agriculture cannot be defined ''regional'', high regional variations in crop distributions occur throughout Italy. This ''regional'' crop variability is strongly related to differences in climate which greatly influence the type of pest to be controlled (and the type of PPP to be used). Knowledge of the regional characteristics of the territory and of the type of crops are therefore key parameters for a correct planning of a national reliable monitoring.		Yes					Yes
16	Organizational	national	Too centralised authorities, which impacts on access to information and data.	Excessive centralization of some institutions can also be indicated as a barrier, which, for example, extends the flow of information within the institution and efficient take of corrective actions, as well as insufficient support of local units by headquaters. Too centralized authorities, and this leads to difficulty in having access to information;	Yes			Yes			
17	Sociological	local	Small impact of consumers on agricultural production.	The impact of consumers on agricultural production is still small (certificates, ecological footprint). The impact of consumers on agricultural production is still small. Stakeholders that set the market conditions and production are the big buyers (large distribution).	Yes		Yes				
18	Technical	local	Lack of precise data regarding catchments.	There is still uncertainty in relation to the delineation of the extraction area for the Vester Hjerk water work. It is questionable if the delineated area currently included in the legislation is correct, which makes difficult to plan implementation of measures, except for the agricultural area just around the two drillings providing the drinking water. It is likely that the farmers will question measures on agricultural land further away from the water work. There is a need to identify both vulnerable and robust agricultural land in relation to the protection of the ground water. Spatial optimization of farming practices requires detailed information on the biophysical endowment and acknowledged identification of the differentiation in terms of impact of agricultural practices. It is difficult to have a good overview of drinking water quality as approx. 50% of domestic dwellings in Co. Wexford have an on-site waste water treatment systems and typically have their own private drinking water well; these are not part of monitoring programmes.					Yes		Yes

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19	Technical	local	High costs of monitoring.	Monitoring and analysing for herbicides in water is both complicated and costly, resulting in a poor understanding of i) the influences of handling these products, and ii) mobilisation and transfer processes, which causes difficulties when provodong evidence for action. Monitoring and analyses for herbicides in water is both complicated and costly, resulting in a poor understanding of i) the influences of handling these products, and ii) mobilisation and transfer processes, which causes difficulties when providing evidence for action.			Yes		Yes		
20	Technical	local	Problems with tools used for planning.	The implementation of measures for the protection of the ground water are based on a target for leaching based on modelling with no or very little differentiation of the area of the extraction zone. The modelling do consider some local variables, but important variables such as drainage and location of catch crops are not included.		Yes					Yes
21	Political	local	Underfunding of institutions from water management and environmental sector.	Underfunding of institutions from the water management and environmental protection sector, this results in staff shortages and also impacts on very little interest of public workers in tasks that are beyond their responsibilities (e.g. active participation in research and other projects). Underfunding of institutions from the water management, environmental protection sector, and agriculture departments makes the implementation of necessary improvements difficult.	Yes		Yes				
22	Political	national	Instability of water governance structure, causing periodic suspension in implementation of regulations.	Frequent changes in organizational structures of state institutions, and even whole institutions, which results in the suspension of the implementation of certain activities or their failure.	Yes						
23	Technical	local	Lack of common database that is shared by many institutions.	Absence of one database and information flow between institutions, e.g. irregularities found during an inspection by one of the institutions should be forwarded to other inspection bodies.	Yes						
24	Political	national	Low transparency in water managemnt.	Low transparency on how water management is performed (at local level);				Yes			
25	Technical	local	Lack of specilised personnel.	Lack of specialized personnel to manage water system; insufficient (lack of) training at local level.				Yes			
26	Technical	local	Lack of sufficient advisory services for farmers.	Lack of sufficient advisory services (funded by state) for farmers in relation to impact of agriculture on water quality, subsidy schemes available, compliance etc;				Yes			
27	Technical	local	Poor installation of measures	Proper pesticide storage and handling as treatment of their packaging and remnants are compulsory but improvements and actions could be implemented to ensure that handling, storage and disposal of pesticides and their containers are performed correctly. A still fairly high percentage of farmers (more than 40%) of the area under study don't have a dedicated area for mixing and filling the sprayers.		Yes					
28	Technical	local	Problem with assessment of effectiveness of measures	Some compulsory actions as storage, equipment inspections and calibration, respect of non spray zones are in place in nearly all farms, but their effectiveness cannot really be assessed while is not possible to understand if implemented properly by all the farmers.		Yes					

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29	Technical	local	Lack of practical trainings.	Training is complusory, and operators need a certificate to use pesticide. However, despite the quality level of the regional training system, the training is entirely theoretical and does not include demonstrative activities and sharing of experiences.		Yes					
30	Sociological	national	Variability in the perception of stakeholders influence on drinking water quality among different sectors	There is a large variability in the perception of stakeholders influence on drinking water quality among different sectors					Yes		
31	Legislative	national	Lack of regulations.	Some regulation is lacking. An example of the lack of regulations: new drift reducing technology such as low spray boom is not yet included in the list of drift reducing techniques, while farmers in practice are asking for this technology.						Yes	
32	Legislative	local	Little flexibility for above farm level implementation of measures.	The farmers only have limited options to take advantage of measures implemented above or with impacts above the farm level. More flexibility for above farm level implementation of measures.							Yes

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Table 2 Summary of recommendations for improvement of the current situation identified in the Waterprotect action labs.

No.	Type of Recommendation	Scale	Recommendation for improvement of the current situation - short description of the problem	Recommendation for improvement of the current situation - as stated by Action Lab Leaders	PL	IT	ES	RO	IRE	BE	DK
1	Legislative/political	national	Better coordination between different policy areas.	The introduction of an inter-ministerial, coherent action program, taking into account the results of environmental quality monitoring and scientific research, with an emphasis on the implementation of remedial actions in place of identified irregularities and a systematic assessment of the effectiveness of the implemented program. The introduction of a coherent action program, taking into account the results of environmental quality monitoring and scientific research, with an emphasis on the implementation of remedial actions in place of identified irregularities and a systematic assessment of the effectiveness of the implemented program; A stronger and more collaborative water governance is needed Simply regulation and impose measures that are feasible in practice. This regulation need to be clear, without possibilities for interpretation, although different governmental departments have to work together. These different departments have to see and work together to the common goal they want to reach. Coherent, long term action plan for water quality improvement from the government, in which the farmers taking measures and doing their best are rewarded for their efforts, while the ones not complying with the regulations are punished. Different policy areas including the protection of ground water should be better coordinated. Multiple benefits should be identified both at the planning level and in the evaluation of specific projects. The protection of surface water and costal recipients is currently better integrated in the regulation of agriculture than the protection of groundwater. An example is the regulation of the distribution of catch crops, which targets smaller catchments for the protection of surface waters. Protection of groundwater, i.e. in Vester Hjerk the extraction area, should be included in the targeting providing incentive to the farmers to have catch crops in vulnerable areas. Better coordination of and among agriculture, water and environmental departments. It is necessary to clarify who has the competency of every law implementation.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Sociological	national/local	Conducting awareness-raising campaigns.	Conducting awareness-raising campaigns in order to increase responsibility for the environmental impact of food producers along the entire production process, creating and strengthening the role of consumers in the agricultural industry. Conducting awareness campaigns to increase responsibility for the environmental impact of food producers, but it is necessary to remember that farmers are needed. Improved steering mechanisms such as education, economics, infrastructure and regulation "Purification systems" could represent a good practice and a technically viable alternative mitigation measure of point sources contamination, which enable to treat contaminated liquids from plant protection products directly in the farm. However, due to legislative difficulties related to the use of such systems in farms, previously described, UCSC organised a meeting with the water governance leader, Emilia-Romagna Region, to increase awareness on this subject	Yes	Yes	Yes	Yes	Yes	Yes	

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No.	Type of Recommendation	Scale	Recommendation for improvement of the current situation - short description of the problem	Recommendation for improvement of the current situation - as stated by Action Lab Leaders	PL	IT	ES	RO	IRE	BE	DK
3	Political	national/local	Increase finances for local institutions.	Increasing the institution's financial resources at the local level. Improved steering mechanisms such as education, economics, infrastructure and regulation. Allocate financial resources for setting up advisory services for the benefit of farmers (at local level). Improve management of water supply system at local level (trainings for personnel, technical investments); Increase finances for local level institutions for the benefit for farmers.	Yes	Yes	Yes	Yes	Yes		
4	Sociological	national	Better promotion of voluntary best management measures.	Promote the adoption of voluntary best management practice. In fact, recently, farmers are more conscious of the benefits to use natural resources in a sustainable way because it impacts satisfactorily both in their quality of life and also in their farms.	Yes	Yes	Yes	Yes			
5	Legislative	national/local	Provision of an efficient control mechanism.	Increasing financial penalties for irregularities and conducting re-audits to improve the effectiveness of control activities. Coherent, long term action plan for water quality improvement from the government, in which the farmers taking measures and doing their best are rewarded for their efforts, while the ones not complying with the regulations are punished. Effective implementation of financial penalties for irregularities (applied to juridical but also private entities). Improve capacity of control activities for proper implementation of legislation.	Yes	Yes		Yes		Yes	
6	Technical	national/local	Provision of a collaborative tool, common data base, decision support tool available for many institutions.	Introduction of a common database for controlling and managing institutions in water management and environmental protection, so as to increase the efficiency of the control mechanism. Introduction of a common data base for all water Monitoring Controls made in the Agricultural Park. Set up and maintain/update a data base at local level with corroborated information related to water quality; An effective Decision Support Tool that allows farmers and advisors to connect to the science and access information would be an important development towards sustainable farm systems. Strategies may require different Decision Support Tools for different stages.	Yes		Yes	Yes	Yes		
7	Legislative	national/local	Setting up an incentive programme for implementation of more expensive measures.	Financial compensation would be necessary, with feasible conditions for implementation of the most expensive BMP's application. Higher incentives for best management practices for improvement of water quality and agro-environmental schemes.		Yes	Yes			Yes	
8	Legislative	national	Simplification of regulations.	Simply regulation and impose measures that are feasible in practice. This regulation need to be clear, without possibilities for interpretation, although different governmental departments have to work together. These different departments have to see and work together to the common goal they want to reach. Simplification of regulations and impose measures that are feasible in practice.		Yes	Yes			Yes	

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9	Organizational	national/local	Better collaboration between institutions and actors.	More coordination among institutions related to water and simplification of procedures to benefit the work of the farmers in the Agricultural Park. A collaborative approach involving all stakeholders, both bottom-up and top-down to support local evidence and action. Transparency and trust is required and public and private sectors need to be better linked.		Yes	Yes		Yes		
10	Legislative	national	Better knowledge transfer.	More research for a robust evidence based knowledge transfer and exchange. For example for herbicides we need a better understanding of the mechanisms, drivers and controls of mobilisation and transfer processes (Monitor - understand- inform). We need to unlock the "Policy-Science paradigm lock": Identify the best methods for improvement, test scenarios and identify where changes are most needed, efficient and adaptable.		Yes			Yes		
11	Technical	national/local	Improvement of training system.	Improve management of water supply system at local level (trainings for personnel, technical investments); Link environment and farmers and Demo farming participatory events. The knowledge of the factors involved in the contamination processes allow to adopt behaviors or structural changes aimed at limiting and controlling the contamination. There is a growing interest by farmers and operators in more "modern" communication approaches—experimental, demonstrative, and participatory—with more appropriate techniques, with a clear preference for material in audio–video format. An improvement of the training system it recommend with the use a combination of lessons and group discussions, followed by practical demonstrations, which allow "learning" through practice and promote the understanding of the issues addressed.		Yes		Yes			
12	Technical	local	Need for good understanding of catchments to design effective measures.	Relevant measures need to be designed in a sufficiently detailed and targeted way that they can be readily implemented in the strategic plans of the Common Agricultural Policy. At least on vulnerable areas the use of fertilizers should be restricted at field level or even below where needed to differences in the endowment. The mapping of robust and vulnerable areas recommended in point 2 is required for the implementation of the recommendation. Restrictions at or below field level raises questions on control and compliance to be considered in the implementation. The modelling used to identify farming practice measures to protect the ground water should be improved by including more spatially explicit data on for example drainage and catch crops. To ensure acceptance by farmers, the modelling ideally could be combined with measurements of nitrate in drainage systems or catchments. The mapping of vulnerable and robust areas should be improved aiming to represent the field level and below. The map should consider both impact on ground water, surface waters and coastal recipients and include drainage information and improved differentiation of retention.					Yes		Yes
13	Organizational	local	Need for change in organisation of water	Establish a department (at local level, eg within Mayor House, which is the water provider in RO action lab) that may monitor regularly water quality and consequently inform other decision makers and act				Yes			

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			governance at local level.	accordingly for water quality improvement;							
14	Technical	local	Support from local authorities in creation measures that would commonly available	Actions supporting farms to upgrade or create equipped product mixing areas and for filling the sprayer could be of interest		Yes					
15	Technical	local	Conducting feasibility studies.	Conduct a feasibility study that may provide coherent, long term actions for enabling sufficient water quantity at local level (targeting especially periods when water stress is due to increase in tourism flow);				Yes			
16	Technical	local	Draw up a managing programme to deal with the deficiencies of the drainage network in the Agricultural Park's.	Draw up a managing programme to deal with the deficiencies of the drainage network in the Agricultural Park's.			Yes				
17	Technical	local	Evaluation of effectiveness of measures at different scales.	Currently a few measures have been implemented allowing initiatives by single farmers to benefit a wider group of farmers. It is the case for constructed wetlands where the effect of the wetlands is included in the calculation of reduction efforts at catchment level and for voluntary catch crops where a high uptake prevents obligatory catch crops at catchment level. It should be evaluated if the same principles can be implemented for a wider range of measures.							Yes
18	Technical	local	Implementation of metering system for water use.	Impose to all consumers (at local level) a metering water system so it will prevent losses and may permit further improvements for better water quality;				Yes			
19	Technical	local	Implementation of sewage system.	Finalize sewage system at local level and provide connection of all households, thus preventing seasonal surface water nitrate pollution;				Yes			
20	Technical	local	Use pracautionary principle when necessery and design measures at broader areas when time is needed for defining precise locations for actions.	The extraction area for the Vester Hjerk water work should be established as soon as possible to enable implementation of the necessary measures to protect the groundwater However, it is a very complicated a long process to change the delineation of the extraction area in the legislation. Given this timeframe and the uncertainty inherent in the identification of the extraction area, it might be feasible to identify a larger area for implementation of measures voluntary for the farmers.							Yes
21	Technical	local	Implementation of measures	"Purification systems" could represent a good practice and a technically viable alternative mitigation measure of point sources contamination, which enable to treat contaminated liquids from plant protection products directly in the farm.		Yes					

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